REMARKS

Claims 1-11 are in this case. All claims have been rejected. A typographical error has been corrected in the specification. Claim 1 has been amended to clarify the structure of the plurality of delay lines as being an array of optical fiber paths having slightly differing lengths due to their location in the array.

Claims 1-2, 5, and 8-9 are rejected under 35 U.S.C. 103(a) as unpatentable over U.S. Patent No. 5,018,816, "*Optical Delay Switch and Variable Delay System*", issued May 28, 1991 to Murray, et al. (hereinafter "Murray") in view of U.S. Patent No. 6,356,377, "*MEMS Variable Optical Delay Lines*", issued March 12, 2002 to Bishop et al. (hereinafter "Bishop"). These rejections are believed inapplicable to the claims as amended.

It is well established that for a combination of references to make obvious a claimed invention, the combination must teach or suggest each and every limitation of the claim. And, the references can only be combined if there is some suggestion to do so. Without such a suggestion the combination is improper.

In the present case, the specification points out that the optical delay lines are useful in many applications. Some applications require only one fixed delay or several predetermined fixed delays. In these relatively simple applications, the delay line can be simply cut to the required length from optical waveguide stock to achieve a particular delay. But, to achieve highly accurate delays the corresponding precision required in the length of the delay line can exceed the resolution available for physically cutting materials. (Specification, page 2, line 5). Also, there are applications that require a continuous selection from a range of precise delays. (Specification, page 2, line 1).

The specification then teaches that this problem can be solved by using one or more arrays of closely spaced optical fibers. (Specification, page 3, line 10). The fibers are laid out by a computer guided point to point placement process. Each fiber is held in its final place by an adhesive on the substrate. (Specification, page 4, line 13). In the straight regions the array of fibers is similar to a multifiber ribbon. (Specification, page

4, line 6). But in the region where the fibers bend (in contrast to fibers bound in a ribbon) each fiber has a slightly different dimension than the one next to it. (Specification, page 3, line 12).

Since each fiber has a slightly different length, each fiber is a delay line with a slightly different time delay than the one next to it in the array of fibers. All of the fibers in the array end at a reflecting surface. (Specification, page 3, line 14). Light entering each fiber propagates to the reflective surface and back creating a delay set by the length of that particular fiber. (Specification, page 5, line 13). Light coming into the inventive device is reflected from a scanning mirror to at least one mirror in a MEMS array that directs the light to a particular selected fiber. (Specification, page 5, line 10). The light is then output with the delay caused by the selected optical fiber path at the output port of the device. (Specification, page 2, line 5). It is thus possible to achieve very fine differences in delay by selecting a given path in the array. Claim 1 recites such a variable delay line comprising an array of closely spaced curved paths and an optical switch.

The Examiner cites to Murray as disclosing variable optical delays with differing radii of curvature. The problem is that Murray uses a plurality of lengths of waveguide that have been physically cut to length to establish an optical delay line. Thus Murray can only provide one or more optical delays only as accurate as one can physically cut lengths of fiber. This is the very problem that the invention solves. The inventive device, in stark contrast with Murray, can produce a range of very closely spaced delays with very well defined and small differences. (Specification, page 5, line 21).

Murray teaches that individual lengths of cut optical fiber provide delays and that an optical path can include more than one fiber in the optical path, thus increasing the total delay. Amended claim 1 calls for an array of closely spaces optical fibers. Murray does not suggest, teach, or motivate one skilled in the art to fabricate an array of optical fibers with slightly differing lengths caused by bending the array on a mounting plate.

Bishop discloses a variable delay MEMS system. The optical time delay is introduced by moving a corner reflector on a micromachined rack. The varying physical

path length creates a variable delay. Bishop is wholly devoid of any teachings regarding the use of optical fibers in arrays to create a range of delays or the use of arrays of mirrors to direct light to a given optical fiber path in an array of optical fibers. Bishop is believed inapplicable to the instant invention.

Claims 2, 5, and 8-9 are dependent claims on amended claim 1. As dependendent claims, they add additional limitations to those of claim 1. Neither Murray nor Bishop taken alone, or in combination render amended claim 1 obvious. Therefore these references also do not render claims 2, 5, and 8-9 obvious.

Claims 3-4, and 6-7 are rejected under 35 U.S.C. 103(a) as unpatentable over Murray in view of U.S. Patent No. 5,793,508, "*Wavelength-Division Multiplexing Telecommunications System and Method Providing a Controlled Separation of the Output Channels*", issued August 11, 1998 to Meli et al. (hereinafter "Meli"). The Examiner offers Meli as disclosing a Bragg element switchable between reflection and transmission.

Claims 3-4, and 6-7 are dependent claims on amended claim 1. As dependendent claims, they add additional limitations to those of claim 1. Neither Murray nor Meli taken alone, or in combination render amended claim 1 obvious. Therefore these references also do not render claims 3-4, and 6-7 obvious.

Claims 10-11 are rejected under 35 U.S.C. 103(a) as unpatentable over Murray. The Examiner offers Murray as disclosing a 1xN MEMS optical switch that makes the NxM MEMS optical switch of the invention obvious.

But, claims 10-11 are dependent claims on amended claim 1. As dependendent claims, they add additional limitations to those of claim 1. Murray does not render amended claim 1 obvious. Therefore Murray also does not render claims 10-11 obvious.

In view of the foregoing it is submitted that claims 1-11 patentably distinguish from all cited art and that this case fully complies with the requirements of 35 U.S.C.

Section 103. Accordingly this case is now in condition for allowance. Reconsideration and favorable action in this regard are therefore earnestly solicited.

Respectfully submitted,

Glen E. Books
Reg. No. 24,950
Attorney for Applicants

November 18, 2002

LOWENSTEIN SANDLER PC
65 Livingston Avenue
Roseland, NJ 07068
Tel.: 973-597-6162

AMENDED SPECIFICATION SHOWING CHANGES

DETAILED DES[A]CRIPTION

AMENDED CLAIMS SHOWING CHANGES

1. A variable optical delay line comprising:

[a plurality of optical fiber paths, each path comprising at least one reflective element and a first region different in curvature from the other paths in the plurality to provide respectively different optical delay paths]

a plurality of fibers, each fiber having a first end disposed in a first linear array and a second end disposed in a second linear array and a curved region between the first end and the second end, the curved regions of respective fibers differing in curvature to provide a series of monotonically differing path lengths; and

an optical switch for switching at least one optical input signal among the fibers of the plurality.